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MEMOIRS OF THE HOURGLASS CRUISES

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AMPHIPOD CRUSTACEA. II. FAMILY BATEIDAE

By

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ABSTRACT

Five species of bateid amphipods (*Batea catharinensis* Müller, *Carinobatea carinata* Shoemaker, *C. cuspidata* Shoemaker, *C. bousfieldi* new species, and *C. campi* new species) were collected during a 28-month sampling program at ten stations (6–73 m deep) along two east-west transects on the central West Florida Shelf. An additional species (*Batea* cf. *transversa* Shoemaker) was collected in Cuban waters and is included in the review. The species are diagnosed and illustrated, and their distributions and symbioses are discussed. Seasonality, distribution, and diet and feeding habits of *C. carinata* within the Hourglass transects are also examined.

RESUMEN

Durante un programa de muestreos efectuado en diez estaciones (6–73 metros de profundidad) a lo largo de dos transectos de este a oeste en la plataforma occidental de la Florida, se obtuvieron cinco especies de anfípodos de la familia Bateidae (*Batea catharinensis* Müller, *Carinobatea carinata* Shoemaker, *C. cuspidata* Shoemaker, *C. bousfieldi* especie nueva, y *C. campi* especie nueva). *Batea* cf. *transversa* Shoemaker, encontrada en aguas cubanas, se incluye en este trabajo. De cada una de las especies mencionadas, se presentan su diagnosis,

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ilustraciones, distribución, y los casos de simbiosis detectados. La variación estacional y los hábitos alimentarios de *C. carinata* también se determinaron.

INTRODUCTION

The first record of a bateid amphipod was provided by Müller (1865), who described *Batea catharinensis* from the coast of Brazil. The family was not mentioned again until 1901 when Townsend, examining the amphipods collected by the U.S. Fish Commission steamer *Albatross*, gave some information regarding bateid amphipods. Holmes (1903) reported on the material dredged three years before by the U.S. Fish Commission steamer *Fish Hawk* near Woods Hole, Massachusetts, and also reported on specimens collected by himself and by Dr. Fish at the same locality. Stebbing (1906) noted that *B. catharinensis* was the only species of Bateidae known at that time. Kunkel (1918) included bateid amphipods in "The Arthrostraca of Connecticut." Three specimens of *B. catharinensis* were taken by the Barbados-Antigua Expedition of the State University of Iowa (Shoemaker, 1921). The *Fish Hawk* dredged specimens from several localities off the east coast of the United States during 1889–1921, and the *Albatross* in 1912 obtained the first representative of the genus *Batea* from the west coast of America. In 1912, 1918, and 1925, respectively, the Venice Marine Biological Station of the University of Southern California, P. S. Barnhart of the Scripps Institution, and Dr. W. Schmitt procured additional material from southern California. All these specimens were revised by Shoemaker (1926) in his paper on the bateid collection in the U.S. National Museum of Natural History, which remains the most important paper on this family of amphipods. Fish (1926) included bateids in his study of the seasonal distribution of plankton at Woods Hole. Shoemaker (1942) mentioned that this group of amphipods was collected by the Presidential Cruise of 1938. Wass (1965) included bateids in his checklist of marine invertebrates of Virginia. Barnard (1969a, b) pointed out that bateids are tropical amphipods and described two new species and one subspecies from the Gulf of California. Bousfield (1973) and Christmas and Langley (1973) offered several additional records of *B. catharinensis*; and Farrell (1970, 1979), Fenchel (1970), Watling and Maurer (1972), Williams and Bynum (1972), Fox and Bynum (1975), Calder et al. (1976), and Nelson (1980) provided additional information regarding western Atlantic Bateidae.

Ortiz (1974, 1976, 1978) recorded the Cuban species of Bateidae and later (1979a, b) summarized known records of the species of this family in the American Mediterranean (Gulf of Mexico and Caribbean Sea).

In the present paper, I report species of Bateidae collected during the Hourglass Cruises and offer additional information on specimens from Cuba.

ACKNOWLEDGMENTS

I thank David K. Camp, Florida Marine Research Institute, Department of Natural Resources, and Dr. Edward L. Bousfield, National Museum of Natural Sciences of Canada, for lending the material from the Hourglass Cruises, furnishing necessary data, and critically reading the manuscript. I thank the editorial review board of the Florida Marine Research Institute for useful comments on the manuscript. I am grateful to the Director, Centro de Investigaciones Marinas,

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METHODS AND MATERIALS

This paper is based principally on material obtained during the Hourglass Cruises at ten stations on the central West Florida Shelf from August 1965 through November 1967 (Figure 1, Table 1). All benthic stations were sampled monthly at night with a rectangular box dredge and with a standard 20-ft (6.1-m) trynet; Stations B, C, and D were sampled again during the day with a dredge and trynet later in each month (Joyce and Williams, 1969).

The Cuban material was collected on the western platform by washing algae over a sieve, by using the corer of Băcescu (1963), or by using a small dredge covered with plankton netting (Ortiz, 1976) (Figure 2, Table 2).

Specimens were preserved in 10% formalin, and those from Hourglass Cruises were later placed in 70% ethanol for storage.

Terminology used in this paper follows that of Barnard (1969a). The following terms were used during analyses of stomach contents: full, stomach more than 50% full; partially full, stomach less than 50% full; and empty, little or no material present. I made all figures of specimens using a camera lucida. Measurements are in millimeters (mm) and are from the tip of the rostrum to the base of the telson, measured with the animal in a straight (nonflexed) position.

All of the Cuban material is deposited in the Invertebrate Collection of the Centro de Investigaciones Marinas (CIM), Facultad de Biología, Universidad de La Habana. Holotypes and paratypes are deposited in the U.S. National Museum of Natural History (USNM), Washington, D.C., and in the Marine Invertebrate Collection (FSBC I) of the Florida Marine Research Institute, St. Petersburg.

SYSTEMATICS

Family Bateidae Stebbing, 1906

Diagnosis: Body smooth or dentate dorsally; accessory flagellum of antenna 1 absent, mouthparts normally developed; coxa 1 vestigial or absent; coxae 3 and 4 very large, 4 largest; gnathopod 1 reduced to 2 segments, with few setae in males, several more in females; last 2 or 3 pairs of legs with large posterior lobes on article 2; sexual dimorphism slight, but antennae calceolate in males and uropod 3 more setose in females.

Remarks: The family Bateidae comprises ten species in two genera, *Batea* and *Carinobatea*, which are known only from the western Atlantic and eastern Pacific oceans. Members of the family are benthic dwellers, most of which occur principally in warm-temperate and tropical marine waters 1–73 m deep. All tend to lose the terminal parts of legs and antennae upon capture. The two recognized genera may be distinguished by the following key.

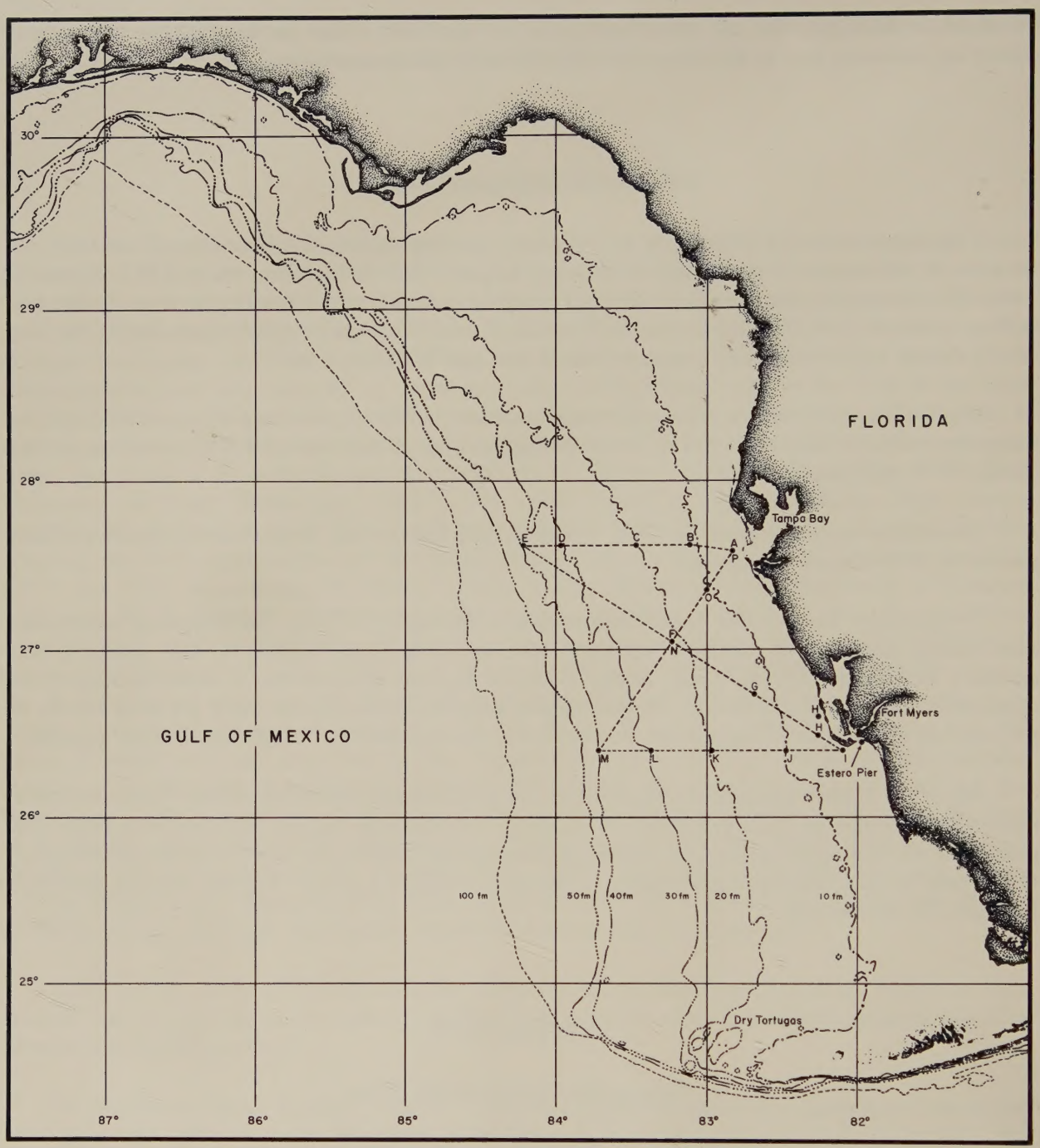

Figure 1. Hourglass cruise pattern and station locations.

TABLE 1. LOCATIONS AND DEPTHS OF BENTHIC HOURGLASS STATIONS.

Station	Latitude	Longitude	Established Depth (m)	Approximate Nautical Miles Offshore*
A	27°35′N	82°50′W	6.1	4, due W of Egmont Key
B	27°37′N	83°07′W	18.3	19, due W of Egmont Key
C	27°37′N	83°28′W	36.6	38, due W of Egmont Key
D	27°37′N	83°58′W	54.9	65, due W of Egmont Key
E	27°37′N	84°13′W	73.2	78, due W of Egmont Key
I	26°24′N	82°06′W	6.1	4, due W of Sanibel Island light
J	26°24′N	82°28′W	18.3	24, due W of Sanibel Island light
K	26°24′N	82°58′W	36.6	51, due W of Sanibel Island light
L	26°24′N	83°22′W	54.9	73, due W of Sanibel Island light
M	26°24′N	83°43′W	73.2	92, due W of Sanibel Island light

*U.S. Coast and Geodetic Chart No. 1003, dated June 1966.

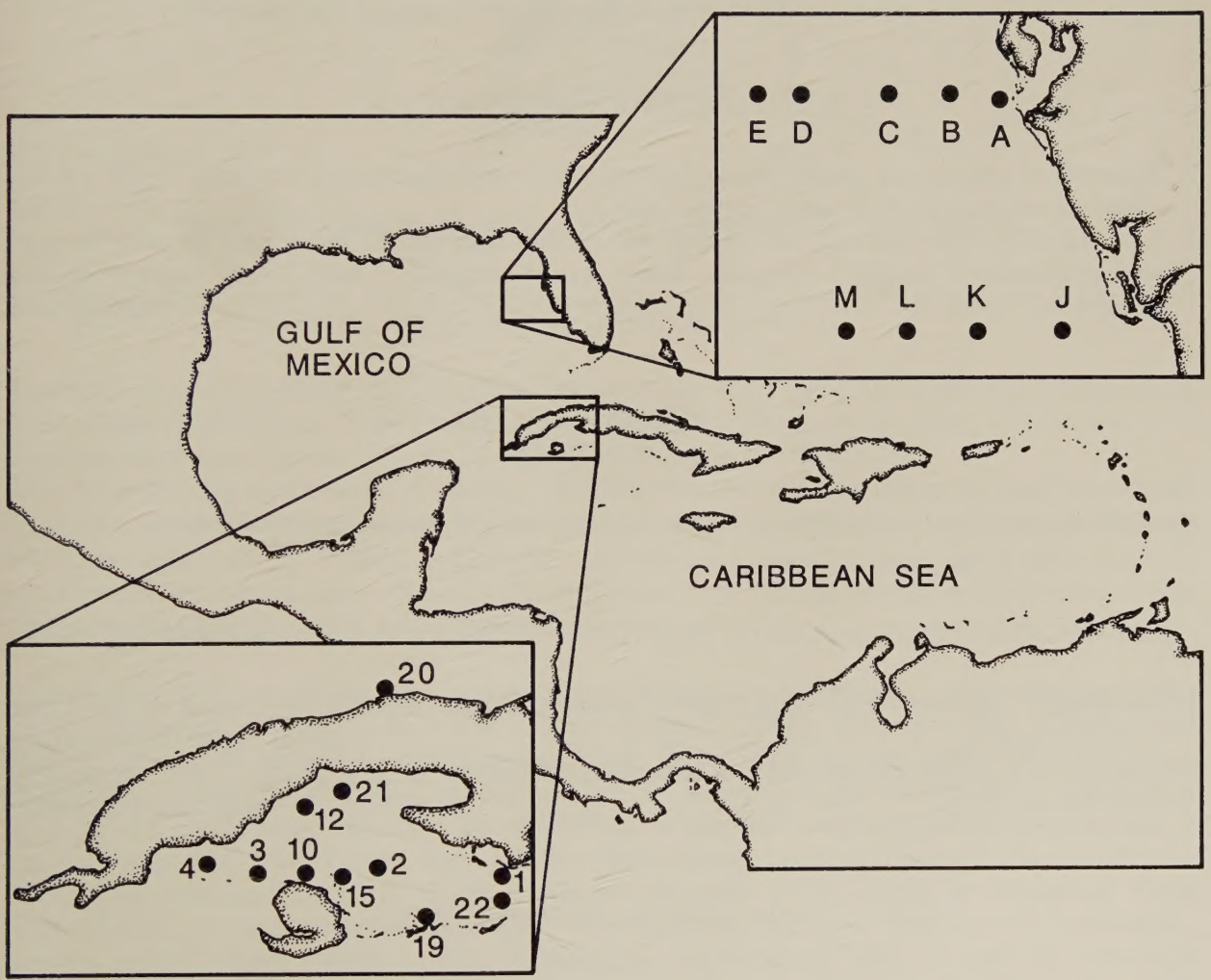

Figure 2. Hourglass stations and western Cuban platform stations where bateid amphipods were collected.

TABLE 2. LOCATIONS, DATES, BOTTOM TYPES, AND DEPTHS OF CUBAN STATIONS WHERE BATEID AMPHIPODS WERE COLLECTED.

Station	Latitude	Longitude	Date	Bottom Type*	Depth (m)
1	22°02'N	81°33'W	2-XII-70	—	3.5
2	22°01'N	82°30'W	15-II-70	—	6
3	21°56'N	83°15'W	23-IV-71	—	4
4	22°03'N	83°41'W	14-XII-70	—	3.5
10	21°57'N	82°59'W	20-VI-74	—	4
12	22°18'N	82°57'W	21-III-69	s, m, a, T	6
15	21°54'N	82°39'W	22-III-69	m, T, a, s	7
19	22°01'N	82°30'W	21-VI-74	—	6.5
20	23°13'N	81°15'W	4-VII-80	a	1.5
21	22°62'N	82°63'W	14-VIII-74	T, S	1
22	22°02'N	81°40'W	6-IV-71	Hs	4

*s, sand; m, mud; T, *Thalassia testudinum*; S, *Syringodium*; a, algae; Hs, stomach contents of *Haemulon sciurus*.

KEY TO GENERA OF BATEIDAE

1. Segments of pereon and pleon smooth, lacking dorsal teeth; gnathopod 2 articles 3 and 4 short, subequal; uropods 1 and 2 stout, lightly spinose ..... *Batea*
1. Last segment of pereon and first or first and second segments of pleon may be dorsally dentate; gnathopod 2 article 3 elongate, longer than 4; uropods 1 and 2 very slender, heavily spinose ..... *Carinobatea*

Genus *Batea* Müller, 1865

Diagnosis: Body segments dorsally smooth; antenna 1 article 1 without process; lower lip with inner lobes; maxilliped outer plates not quite reaching apex of second article of palp.

KEY TO SPECIES OF *BATEA* IN THE GULF OF MEXICO AND CARIBBEAN SEA

1. Gnathopod 2 palmar margin very oblique; mandibular palp article 2 very setose on inner side ..... *Batea catharinensis* Müller
1. Gnathopod 2 palmar margin more or less straight; mandibular palp article 2 with subterminal setae only ..... *Batea* cf. *transversa* Shoemaker

Batea catharinensis Müller, 1865

Figure 3

Batea catharinensis Müller, 1865, p. 276; Stebbing, 1906, pp. 355, 356; Shoemaker, 1921, p. 276; 1926, pp. 2–9, figs. 1–4; 1942, p. 12; Wass, 1965, p. 36; Barnard, 1969a, p. 164, fig. 69b, c, l, m; Farrell, 1970, p. 22; Watling and Maurer, 1972, pp. 259, 262, 263; Williams and Bynum, 1972, pp. 177, 178, 180–185, 188–190; Christmas and Langley, 1973, pp. 276, 278, 279; Ortiz, 1974, pp. 84–86, unnumbered fig.; Fox and Bynum, 1975, pp. 225, 229, 230; Calder et al., 1976, pp. 24, 29; Farrell, 1979, pp. 410, 412, 413; Nelson, 1980, p. 82.

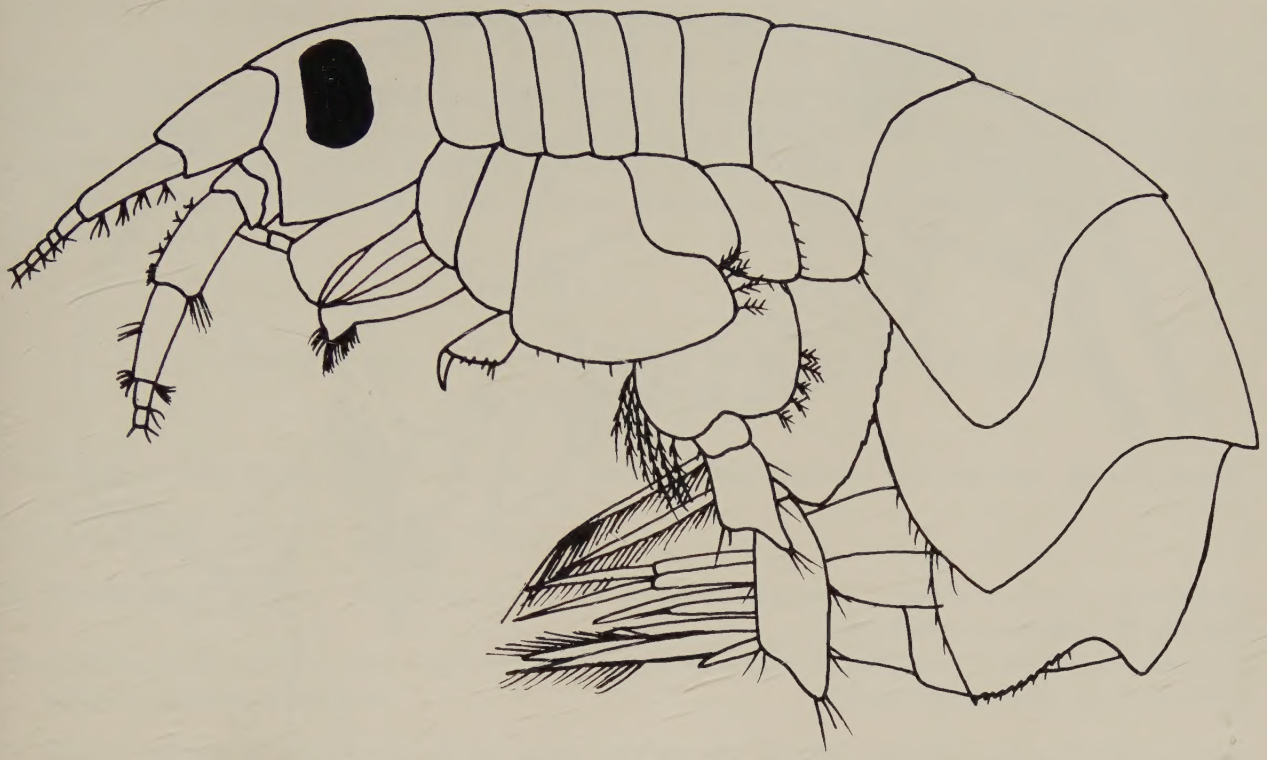

Figure 3. *Batea catharinensis* Müller, 1865; ♂; Golfo de Batabanó, Cuba; Station 15.

Batea secunda Holmes, 1903, p. 284; 1905, pp. 499, 500, unnumbered fig.; Rathbun, 1905, p. 66; Stebbing, 1906, p. 729; Sumner et al., 1913, pp. 651, 652; Kunkel, 1918, pp. 89, 90, fig. 18; Fish, 1926, pp. 149, 151.

Material examined: HOURGLASS STATIONS: None.—OTHER MATERIAL: CUBA: 8 ♂, 10 ♀; Golfo de Batabanó, Station 4; 3.5 m; 14 December 1970; Băcescu corer; CIM.—3 ♂, 5 ♀; Golfo de Batabanó, Station 15; 7 m; 22 March 1969; Băcescu corer; CIM.

Diagnosis: Rostrum abruptly narrowing to acute tip; pereon and pleon dorsally smooth; lower lip with inner lobes deeply incised; mandibular palp article 2 heavily setose along entire margin; gnathopod 2 palmar margin very oblique, little longer than ventral margin in both sexes; telson cleft more than half its length, lobes uniformly rounded.

Distribution: The species has been reported from Massachusetts (Holmes, 1905; Sumner et al., 1913; Shoemaker, 1926), Long Island Sound (Kunkel, 1918), Delaware Bay (Watling and Maurer, 1972), Chesapeake Bay (Shoemaker, 1926; Wass, 1965; Nelson, 1980), North Carolina (Williams and Bynum, 1972; Fox and Bynum, 1975), South Carolina (Shoemaker, 1926; Calder et al., 1976), and Georgia (Fox and Bynum, 1975). In the Gulf of Mexico and Caribbean Sea, it has been reported from Tampa Bay, Florida (Shoemaker, 1926); Mississippi Sound (Farrell, 1970; Christmas and Langley, 1973); Louisiana (Farrell, 1979); Golfo de Batabanó, Cuba (Ortiz, 1974); and Barbados (Shoemaker, 1921). The type locality is Desterro (=Florianopolis, Santa Catarina), Brazil (Müller, 1865). Additionally, Shoemaker (1942) reported the species in the eastern Pacific from Cedros Island, west of Baja California, and from Magdalena Bay, Baja California. The species is distributed bathymetrically from 1- to 45-m depths. Williams and Bynum (1972) collected this species in surface plankton in North Carolina.

Remarks: Batea catharinensis has been found in sandy mud and in *Thalassia testudinum* in Cuba.

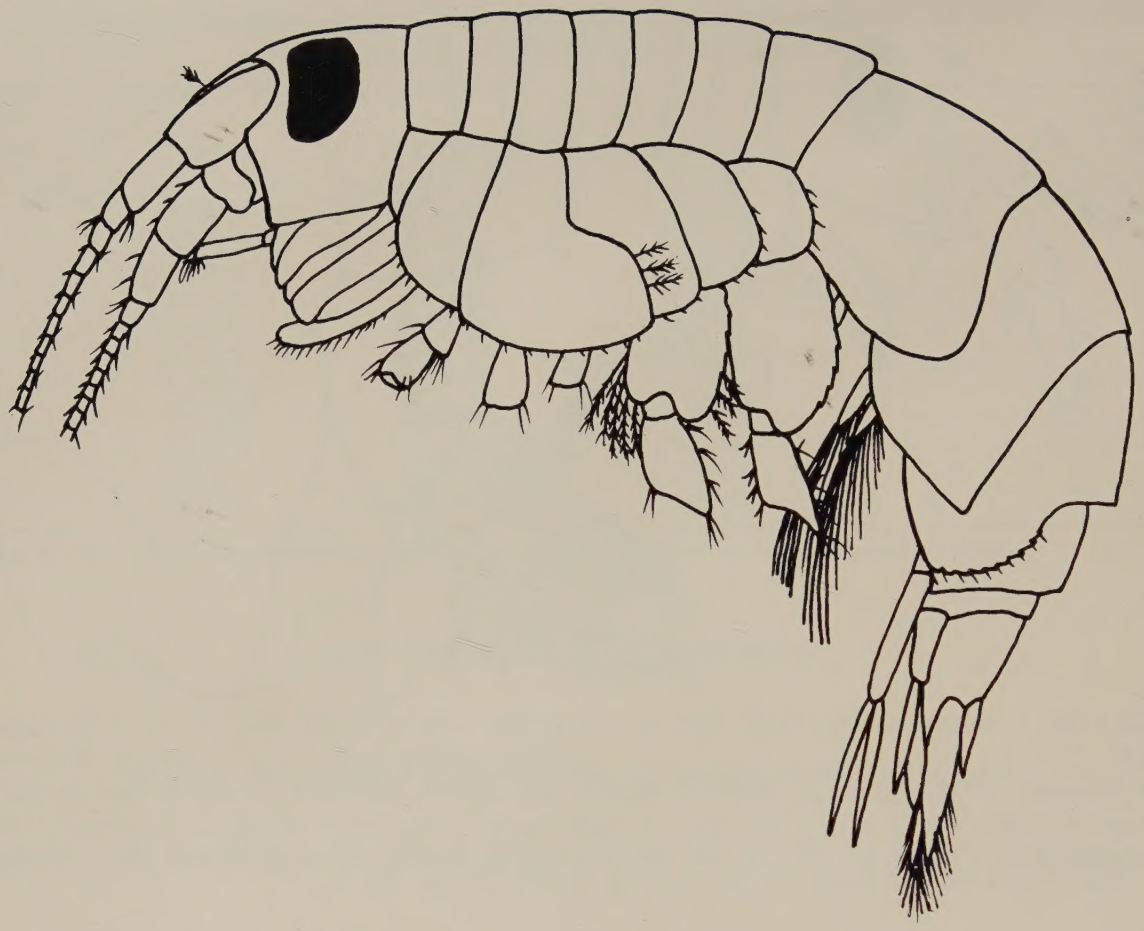

Figure 4. *Batea* cf. *transversa* Shoemaker, 1926; ♂; Golfo de Batabanó, Cuba; Station 21.

Batea cf. *transversa* Shoemaker, 1926

Figure 4

Batea transversa Shoemaker, 1926, pp. 13–18, figs. 8–11; Ortiz, 1978, p. 7.

Material examined: HOURGLASS STATIONS: None.—OTHER MATERIAL: CUBA: 1 ♂, 1 ♀; Golfo de Batabanó, Station 21; 2 m; 14 August 1974; dredge; CIM.—1 ♀; Brisas del Mar Beach, north coast of Habana, Station 20; 1.5 m; 4 July 1980; dredge; CIM.

Diagnosis: Rostrum gradually narrowing to very acute apex; lower lip with inner lobes shallowly incised; mandibular palp article 2 with few subterminal setae only; gnathopod 2 palmar margin almost straight; telson cleft less than half its length.

Distribution: This species is very rarely found in the Gulf of Mexico and Caribbean Sea. It has been reported from two localities on the north and south coasts of western Cuba in 1.5- and 1-m depths, respectively.

Remarks: The Cuban specimens are in very poor condition, and it is necessary to wait for new western Atlantic specimens before determining whether they are identical to *B. transversa* from Baja California or represent an undescribed species.

Genus *Carinobatea* Shoemaker, 1926

Diagnosis: Last pereonal segment dorsally dentate or smooth; first or first two pleonal segments dentate dorsally; dorsal teeth never bifid; lower lip without inner lobes; maxilliped outer plate reaching to or slightly beyond distal end of second article of palp; ventrodistal process of antenna 1 article 1 produced, longer than that of *Batea* (except *C. conductor* Barnard [1969b] from the Pacific Ocean).

KEY TO SPECIES OF *CARINOBATEA* IN THE GULF OF MEXICO AND CARIBBEAN SEA

1. Dorsal surface of body with 3 teeth, one each on last pereonal and first and second pleonal segments 2
1. Dorsal surface of body with 1 or 2 teeth 3

2. Gnathopod 2 article 3 two-thirds length of article 2; pereopod 5 article 2 convex posteriorly ..... *Carinobatea cuspidata* Shoemaker
2. Gnathopod 2 article 3 less than one-third length of article 2; pereopod 5 article 2 straight or slightly concave posteriorly ..... *Carinobatea carinata* Shoemaker

3. Dorsal surface of body with dorsal tooth only on first pleonal segment; coxa 2 subtriangular ..... *Carinobatea bousfieldi* n. sp.
3. Dorsal surface of body with dorsal teeth on first and second pleonal segments; coxa 2 rectangular ..... *Carinobatea campi* n. sp.

Carinobatea cuspidata Shoemaker, 1926

Figure 5

Carinobatea cuspidata Shoemaker, 1926, pp. 21–24, figs. 14, 15; 1933, p. 11; 1935, p. 235; 1948, p. 3; Barnard, 1969a, p. 164, fig. 69a; Ortiz, 1976, p. 17; 1978, p. 7; 1979a, p. 11.

Material examined: HOURGLASS STATION B: 1♂; 11 May 1967; trawl; FSBC I 33570.—1 ♀ (ovig.); 20 May 1967; dredge; FSBC I 33571.—1 ♂; 2 June 1967; dredge; FSBC I 33572.—1 ♂, 1 ♀ (ovig.); 11 September 1967; dredge; FSBC I 33573.—OTHER MATERIAL: CUBA: Golfo de Batabanó, Station 3; 4 m; 23 April 1971; Băcescu corer; CIM.—1 ♂, 2 ♀; same, Station 4; 3.5 m; 14 December 1970; Băcescu corer; CIM.—1 ♂, 1 ♀; same, Station 10; 4 m; 20 June 1974; Băcescu corer; CIM.—1 ♂, 2 ♀; same, Station 19; 6.5 m; 21 June 1974; Băcescu corer; CIM.—3 ♂, 2 ♀; same, Station 22; stomach contents of yellow grunt, *Haemulon sciurus* (Shaw, 1803); CIM.

Diagnosis: Dorsal surface of body with 3 teeth, 1 each on last pereonal and first and second pleonal segments; coxa 4 posterior lobe straight; lower lip with wide, rounded lobes; inner lobe of first maxilla without terminal seta; gnathopod 2 article 3 two-thirds length of article 2; pereopod 5 article 2 with posterior lobe rounded; telson cleft less than half its length.

Distribution: The species is known from only a few localities, including the west coast of Florida (Shoemaker, 1926; Hourglass Station B); Key Largo, Florida (Shoemaker, 1933); Cuba

TABLE 3. NUMBERS OF *CARINOBATEA CUSPIDATA* COLLECTED DURING PROJECT HOURGLASS, BY STATION AND MONTH.

Carinobatea cuspidata

STA	1965					1966													1967										TOT
	A	S	O	N	D	J	F	M	A	M	J	J	J sp	A	S	O	N	D	J	J sp	F	M	A	M	J	J	A	S	O	N	
A																															
B_1																								1	1						2
B_2																								1				2			3
C_1																															
C_2																															
D_1																															
D_2																															
E																															
I																															
J																															
K																															
L																															
M																															
TOT																								2	1			2			5

Subscripts 1, 2, and SP represent regular (night), post (day), and supplementary (45-ft trawl) cruises.

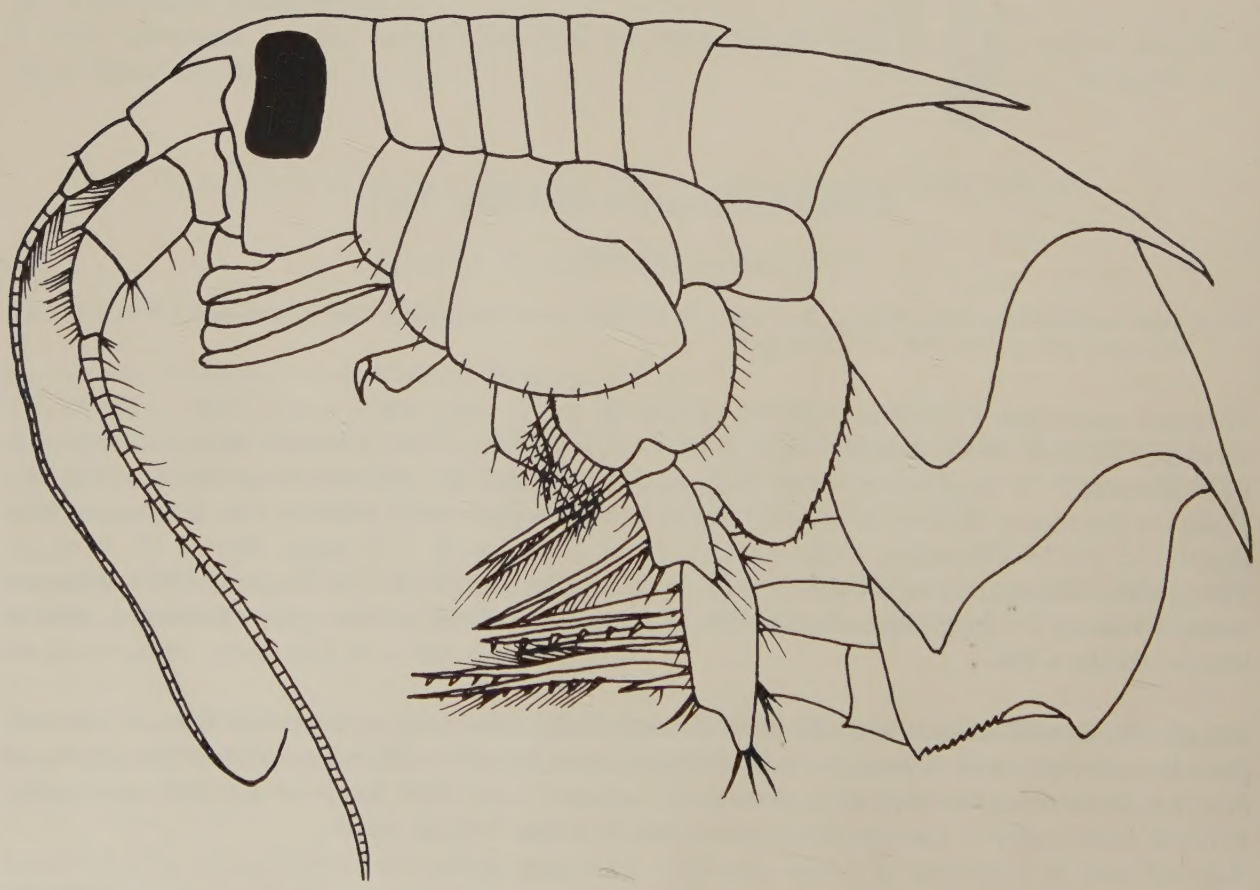

Figure 5. *Carinobatea cuspidata* Shoemaker, 1926; ♂; Golfo de Batabanó, Cuba; Station 10.

(Shoemaker, 1948; Ortiz, 1978; present study); and St. Thomas, U.S. Virgin Islands (Shoemaker, 1926). Shoemaker (1926) also cited a questionable record from Puerto Rico. The known bathymetric range is from shallow water (Shoemaker, 1948; 3.5 m, present study) to 46–49 m. Shoemaker's (1926: 24) record of 64-fm depths for the *Albatross* stations off the west coast of Florida apparently was incorrect; the range of depths given for those stations by Townsend (1901: 398) is 25–27 fm (46–49 m).

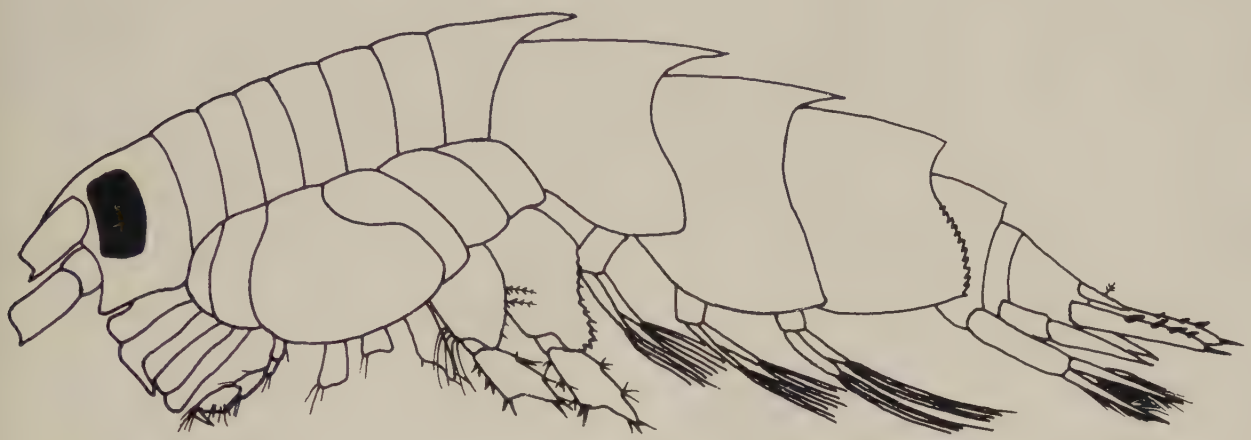

Figure 6. *Carinobatea carinata* Shoemaker, 1926; ♂; Golfo de Batabanó, Cuba; Station 2.

Carinobatea carinata Shoemaker, 1926

Figures 6, 7

Carinobatea carinata Shoemaker, 1926, pp. 24–26, fig. 16; 1948, p. 3; Ortiz, 1976, p. 7; 1978, p. 7; 1979a, p. 11; 1979b, p. 9.

Material examined: HOURGLASS STATION A: 1 ♀; 5 October 1967; trawl; FSBC I 33647.—HOURGLASS STATION B: 1 ♀; 11 April 1967; dredge; FSBC I 33615.—1 ♀; 11 May 1967; dredge; FSBC I 33616.—1 ♂; 11 August 1967; dredge; FSBC I 33637.—HOURGLASS STATION C: 2 ♀; 1 December 1966; dredge; FSBC I 33605.—2 ♀; 5 February 1967; dredge; FSBC I 33609.—1 ♀; 20 May 1967; trawl; FSBC I 33619.—2 ♂, 2 ♀; 2 June 1967; dredge; FSBC I 33622.—2 ♀; 2 June 1967; trawl; FSBC I 33621.—1 ♀; 1 August 1967; trawl; FSBC I 33631.—1 ♀; 11 August 1967; dredge; FSBC I 33638.—1 ♂, 3 ♀; 31 August 1967; trawl; FSBC I 33639.—1 ♂; 21 November 1967; dredge; FSBC I 33658.—1 ♂; 21 November 1967; trawl; FSBC I 33657.—HOURGLASS STATION D: 1 ♀; 21 October 1965; trawl; FSBC I 33587.—2 ♀; 4 December 1965; dredge; FSBC I 33588.—2 ♂, 3 ♀; 19 May 1966; trawl; FSBC I 33591.—5 ♀; 9 September 1966; trawl; FSBC I 33594.—1 ♀; 9 October 1966; dredge; FSBC I 33595.—1 ♀, 2 frag.; 9 November 1966; dredge; FSBC I 33600.—1 ♂, 1 ♀; 20 November 1966; dredge; FSBC I 33604.—1 ♀; 20 November 1966; trawl; FSBC I 33603.—1 ♂; 14 December 1966; trawl; FSBC I 33608.—1 ♂, 1 ♀; 28 February 1967; dredge; FSBC I 33611.—1 ♀; 3 March 1967; dredge; FSBC I 33612.—1 ♂; 15 March 1967; trawl; FSBC I 33613.—1 ♀; 12 May 1967; dredge; FSBC I 33618.—1 ♂; 12 May 1967; trawl; FSBC I 33617.—1 ♀; 21 May 1967; dredge; FSBC I 33620.—2 ♀; 3 June 1967; dredge; FSBC I 33623.—1 ♀; 21 June 1967; dredge; FSBC I 33625.—2 ♀; 12 July 1967; dredge; FSBC I 33630.—1 ♀; 2 August 1967; trawl; FSBC I 33632.—1 ♂, 2 ♀; 1 September 1967; trawl; FSBC I 33640.—1 ♂, 8 ♀; 12 September 1967; dredge; FSBC I 33646.—5 ♂, 15 ♀; 6 October 1967; dredge; FSBC I 33649.—5 ♂, 11 ♀; 6 October 1967; trawl; FSBC I 33648.—3 frag.; 21 November 1967;

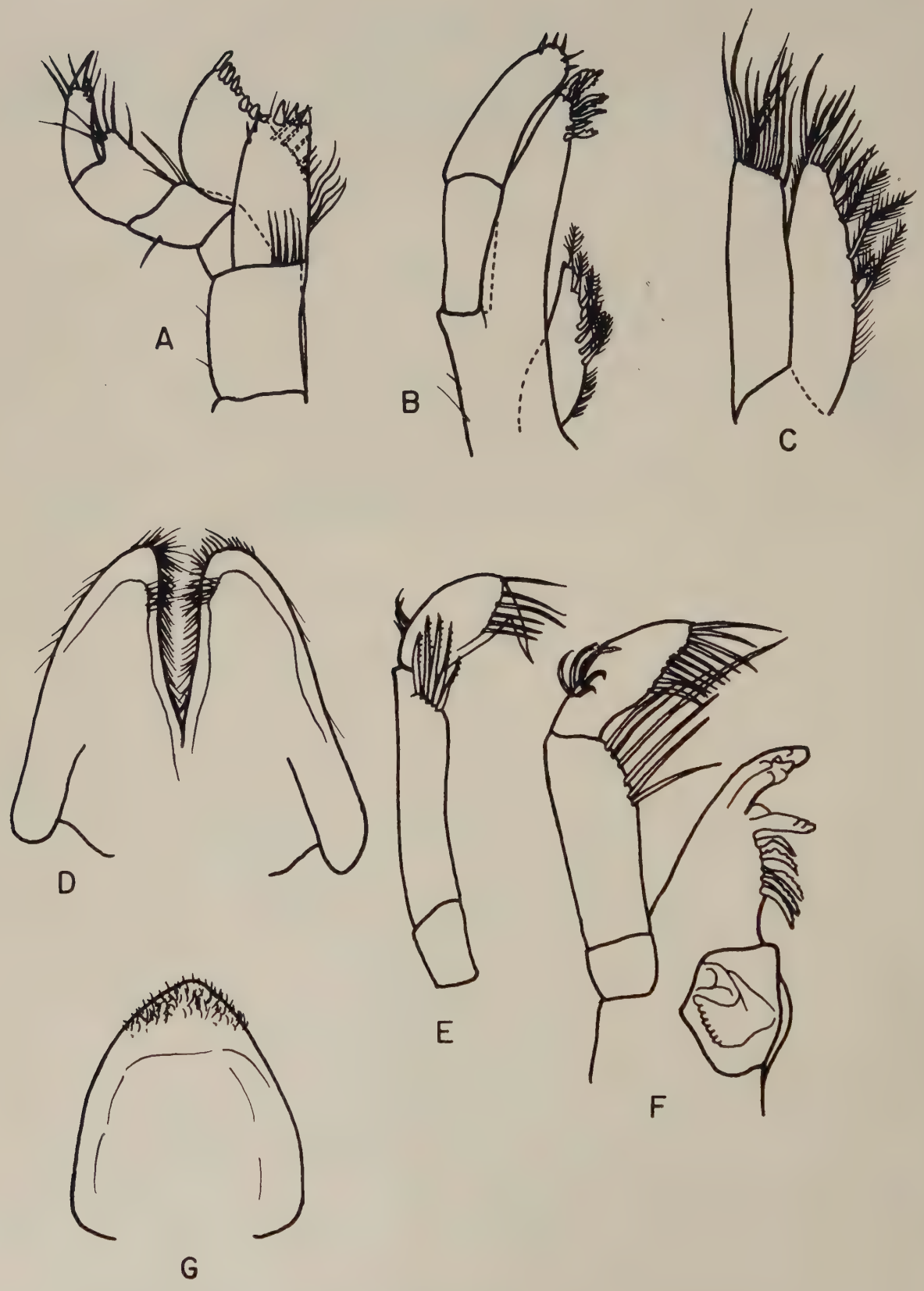

Figure 7. *Carinobatea carinata* 1926; ♂; A. maxilliped; B. maxilla 1; C. maxilla 2; D. lower lip; E. female mandibular palp; F. male mandible; G. male upper lip.

dredge; FSBC I 33660.—3 ♂, 4 ♀; 21 November 1967; trawl; FSBC I 33659.—HOURGLASS STATION E: 1 ♂; 8 February 1966; dredge; FSBC I 33589.—1 ♂; 9 October 1966; dredge; FSBC I 33596.—4 ♂, 6 ♀; 2 August 1967; dredge; FSBC I 33633.—1 ♂, 1 ♀; 1 September 1967; trawl; FSBC I 33641.—2 ♂, 3 ♀; 6 October 1967; dredge; FSBC I 33650.—1 ♂; 3 November 1967; trawl; FSBC I 33652.—HOURGLASS STATION J: 1 ♂, 1 ♀; 14 November 1967; dredge; FSBC I 33653.—HOURGLASS STATION K: 1 ♂, 1 ♀; 5 July 1967; dredge; FSBC I 33626.—1 ♂; 4 September 1967; dredge; FSBC I 33642.—4 ♂, 1 ♀; 14 November 1967; dredge; FSBC I 33654.—HOURGLASS STATION L: 2 ♂; 5 September 1966; dredge; FSBC I 33592.—1 ♂, 6 ♀; 13 October 1966; dredge; FSBC I 33597.—1 ♂; 13 November 1966; dredge; FSBC I 33601.—1 ♀; 7 December 1966; dredge; FSBC I 33606.—1 frag.; 16 February 1967; dredge; FSBC I 33610.—1 ♀; 8 April 1967; dredge; FSBC I 33614.—3 ♂, 3 ♀; 7 June 1967; dredge; FSBC I 33624.—3 ♀; 6 July 1967; trawl; FSBC I 33627.—30 ♂, 61 ♀; 8 August 1967; dredge; FSBC I 33635.—1 ♂, 4 ♀; 8 August 1967; trawl; FSBC I 33634.—3 ♂, 17 ♀; 5 September 1967; dredge; FSBC I 33644.—1 ♂; 5 September 1967; trawl; FSBC I 33643.—1 ♂; 12 October 1967; dredge; FSBC I 33651.—6 ♂, 3 ♀, 3 juv., 1 frag.; 15 November 1967; dredge; FSBC I 33656.—3 ♂; 15 November 1967; trawl; FSBC I 33655.—HOURGLASS STATION M: 1 ♀; 15 February 1966; trawl; FSBC I 33590.—2 ♂, 9 ♀; 5 September 1966; dredge; FSBC I 33593.—1 frag.; 13 October 1966; dredge; FSBC I 33599.—1 ♂, 4 ♀; 13 October 1966; trawl; FSBC I 33598.—1 ♂, 1 ♀; 13 November 1966; dredge; FSBC I 33602.—2 ♂, 1 ♀; 7 December 1966; dredge; FSBC I 33607.—4 ♀; 6 July 1967; dredge; FSBC I 33629.—1 ♂; 6 July 1967; trawl; FSBC I 33628.—1 ♂; 8 August 1967; trawl; FSBC I 33636.—1 ♀; 5 September 1967; dredge; FSBC I 33645.—OTHER MATERIAL: FLORIDA: West coast; *Langust* Stations 10, 15; June 1974 (for additional information see Ortiz, 1979b).—CUBA: Golfo de Batabanó, Stations 1, 2, 4, 10, 12, 15; Băcescu corer.—6 ♂, 13 ♀; Station 22; stomach contents of *Haemulon sciurus*; CIM.

Diagnosis: Dorsal surface of body with 3 teeth, one each on last pereonal and first and second pleonal segments; coxa 4 posterior lobe slightly rounded or straight; lower lip with narrow, rounded lobes; inner lobe of first maxilla with single terminal seta; gnathopod 2 article 3 less than one-third length of article 2; pereopod 5 article 2 with posterior lobe concave or nearly straight; telson cleft half or slightly more than half its length.

Distribution: The species is known from the West Florida Shelf (Shoemaker, 1926; Ortiz, 1979b; Hourglass Cruises) and from the Golfo de Batabanó, Cuba (Shoemaker, 1948; present study) from depths of 3.5–73.2 m.

Remarks: The mouthparts of *C. carinata* (Figure 7), never before described or illustrated, bear many similarities to those of *C. cuspidata*. The narrow lobes of the lower lip and the terminal seta on the inner lobe of the first maxilla are diagnostically important.

Most specimens (75.1%) were collected during September and October 1966 and August through October 1967 (Table 4); 88.9% of all specimens were collected at Stations D, E, L, and M (55–73 m) (Figure 8). Both of these observations were strongly influenced by the fact that 91 specimens (31.5% of all the material) were collected in one day at Station L in August 1967. However, the fact that the species generally occurred more often in individual collections at Stations D, E, L, and M supports the hypothesis that the bathymetric distribution of the species in this area is principally in depths of 55–73 m.

Ovigerous females were collected during March and from May through November (Figure

TABLE 4. NUMBERS OF *CARINOBATEA CARINATA* COLLECTED DURING PROJECT HOURGLASS, BY STATION AND MONTH.

Carinobatea carinata

STA	1965					1966												1967											TOT
	A	S	O	N	D	J	F	M	A	M	J	J	J sp	A	S	O	N	D	J	J sp	F	M	A	M	J	J	A	S	O	N	
A																													1		1
B_1																								1							1
B_2																							1				1				2
C_1																		2			2				6		1	4			15
C_2																								1			1			2	4
D_1					2											1	3					1		2	2		1	3	36		51
D_2			1							5					5		3	1			2	1		1	1	2		9		10	41
E							1									1											10	2	5	1	20
I																															
J																														2	2
K																										2		1		5	8
L															2	7	1	1			1		1		6	3	96	21	1	16	156
M							1								11	6	2	1								5	1	1			28
TOT			1		2		2			5					18	15	9	5			5	2	2	5	15	12	111	41	43	36	329

Subscripts 1, 2, and SP represent regular (night), post (day), and supplementary (45-ft trawl) cruises.

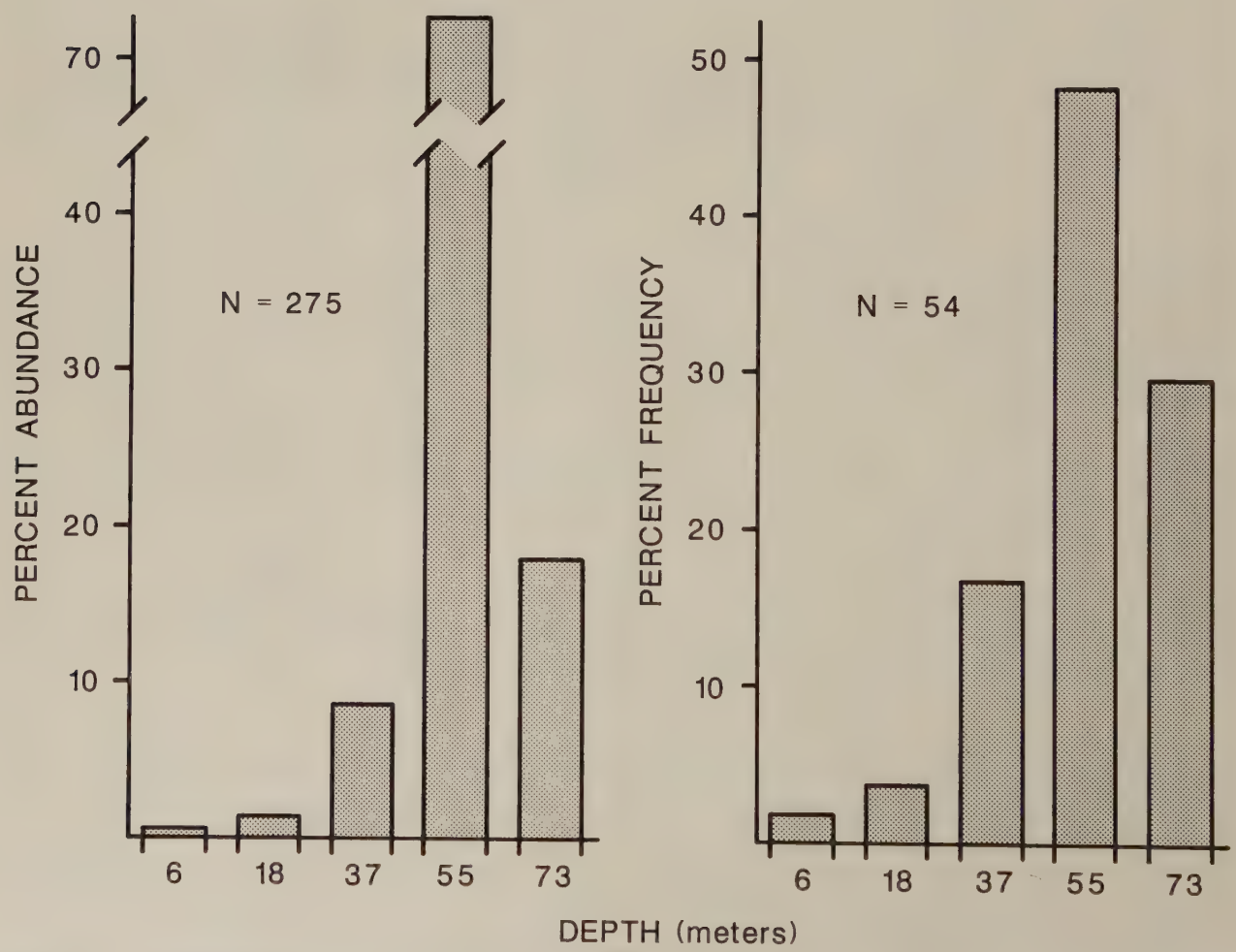

Figure 8. Depth distribution of *Carinobatea carinata*, Hourglass specimens, by abundance and frequency of collection, night samples only.

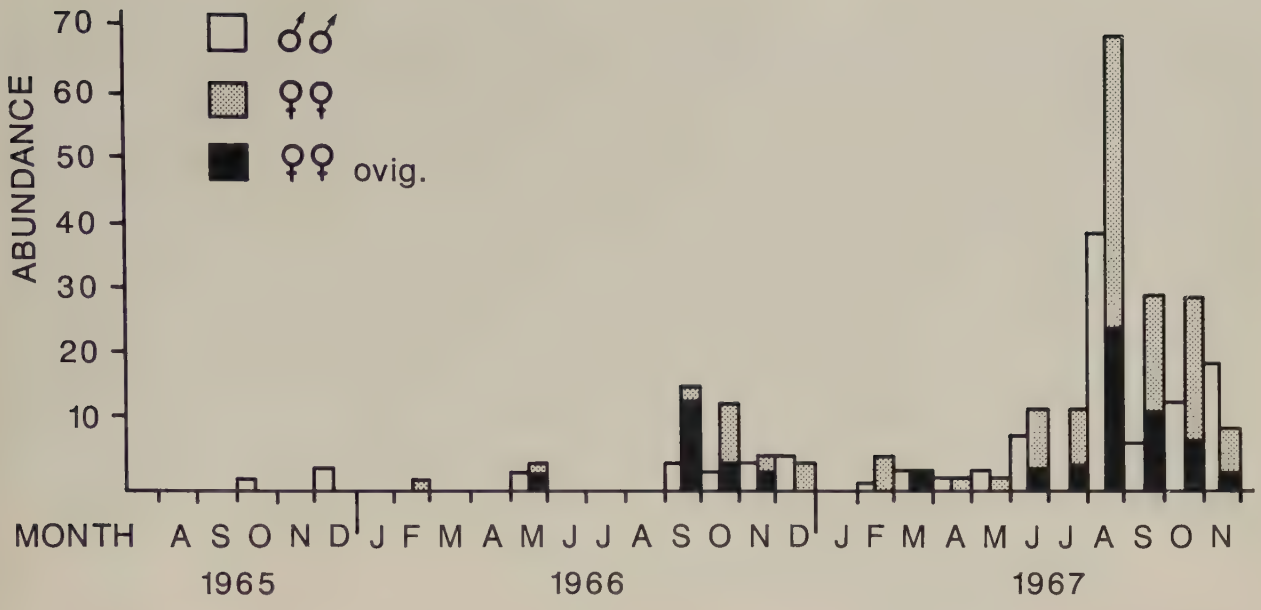

Figure 9. Monthly incidence of *Carinobatea carinata* by sex and reproductive condition in Hourglass collections.

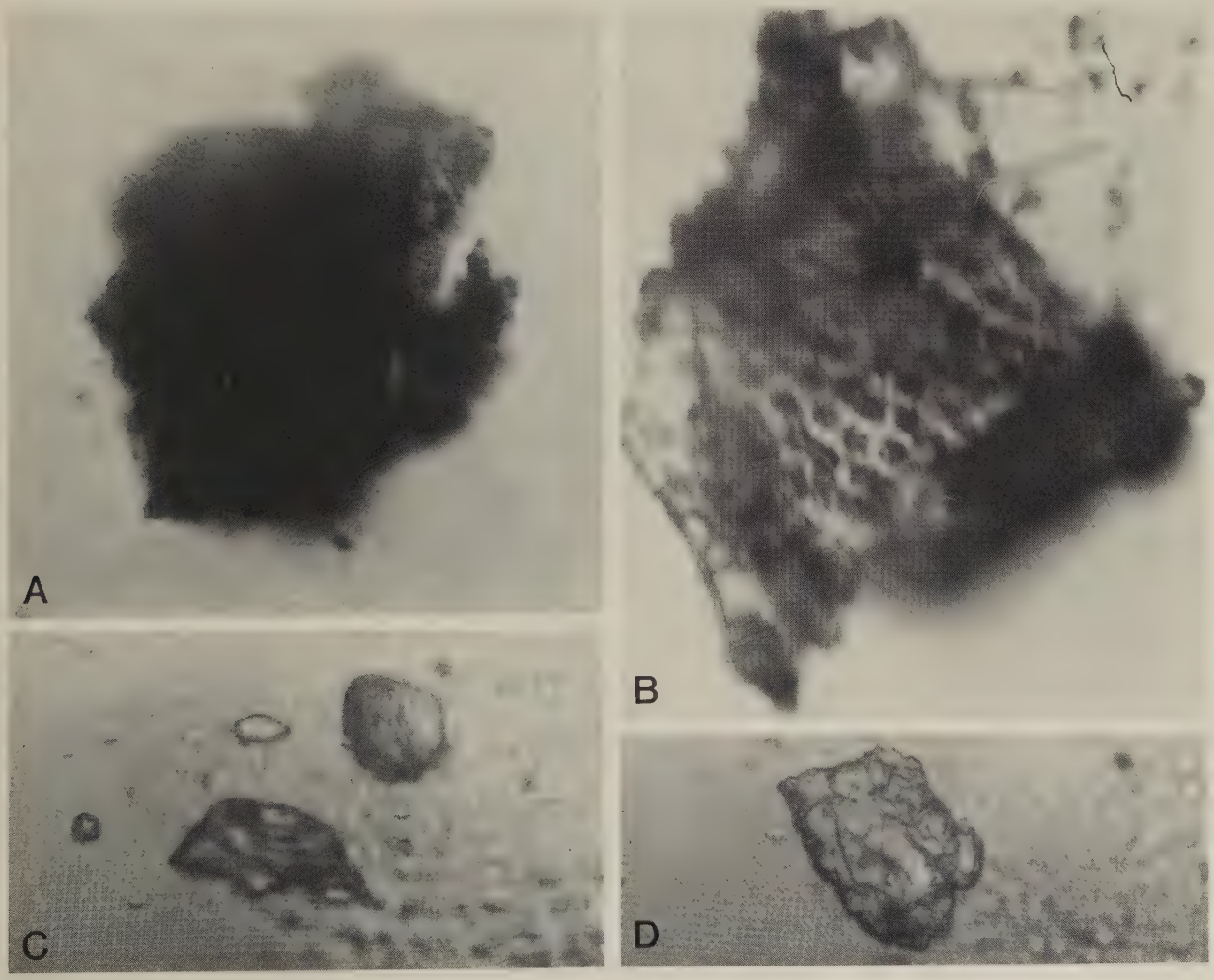

Figure 10. Stomach contents of *Carinobatea carinata*: A, B. vegetable detritus; C, D. mineral particles.

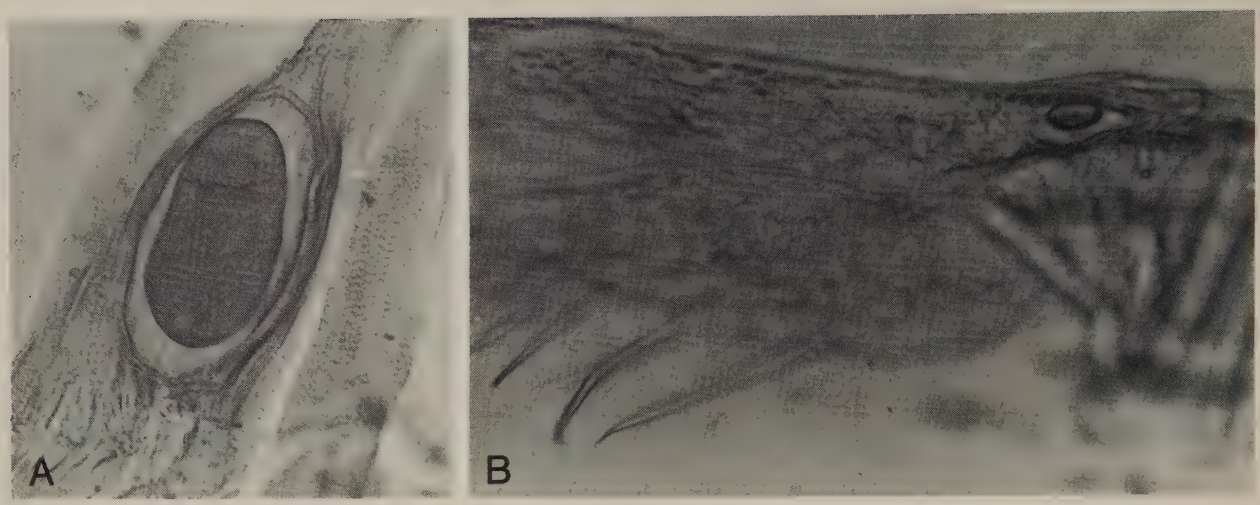

Figure 11. Cysts, probably of Trematoda, on specimen of *Carinobatea carinata*, Hourglass Station L: A. on muscular insertion of pereopod; B. on base of maxilla 2.

9), suggesting reproduction during warmer months. All ovigerous females were collected in depths of 55–73 m.

Few studies have addressed stomach contents of amphipods (Enequist, 1949; Barnard, 1962; Greze, 1968; Fenchel, 1970; Zimmerman et al., 1979), and none has included species of Bateidae. During this investigation, stomach contents of 32 specimens of *C. carinata* from Hourglass stations were examined. Fifteen stomachs were full, 15 were partially full, and 2 were empty. Four categories of stomach contents were identified: plant detritus, organic matter (animal tissue?), mineral particles, and crustacean parts. All 32 stomachs contained both plant detritus and mineral particles (Figure 10), 28 also contained organic matter, and 10 contained crustacean parts (in six cases these were identified as setae of Copepoda). Because it is not known whether the organic matter represented plant or animal tissue and because the crustacean parts could have been ingested from detritus, it seems best to conclude that *C. carinata* in Florida waters consumes plants and detritus, as do most gammaridean amphipods.

Single cysts, probably of Trematoda, were detected on the muscular insertion of a pereopod and on the base of maxilla 2 of a *C. carinata* specimen collected at Hourglass Station L in September 1967 (Figure 11).

Carinobatea bousfieldi, new species

Figures 12–15

Material examined: HOURGLASS STATION C: 1 ♂ PARATYPE; 21 November 1967; dredge; FSBC I 33586.—HOURGLASS STATION E: 2 ♂, 3 ♀ PARATYPES; 9 October 1966; dredge; USNM 253550.—1 ♀ PARATYPE; 9 October 1966; trawl; USNM 253549.—2 ♂, 1 ♀ PARATYPES; 2 December 1966; trawl; USNM 253701.—1 ♀ PARATYPE; 12 May 1967; dredge; FSBC I 33583.—1 ♀ PARATYPE; 12 May 1967; trawl; FSBC I 33582.—1 ♂, 4 ♀ PARATYPES; 2 August 1967; dredge; USNM 253703.—1 ♀ HOLOTYPE; 2 August 1967; dredge; USNM 253704.—HOURGLASS STATION M: 1 ♀ PARATYPE; 6 July 1966; dredge;

Figure 12. *Carinobatea bousfieldi* n. sp.; ♂; Hourglass Station E.

FSBC I 33577.—1 ♀ PARATYPE; 5 September 1966; dredge; USNM 253548.—1 ♀ PARATYPE; 6 July 1967; dredge; USNM 253702.

Description: Male: Head with reniform eyes. Dorsum of body with one tooth on first pleonal somite only; last pereonal somite and remaining pleonal somites dorsally smooth. Gnathopod 1 with 2 terminal setae. Gnathopod 2 article 2 very long, longer than combined lengths of articles 5 and 6; palm subtriangular; palmar margin not oblique, with 2 spines on palmar angle. Coxa 2 rounded, with several setae. Coxa 3 spatuliform. Coxa 4 largest, with posterior lobe wide, rounded. Pereopods 2 and 3 with article 2 narrow. Pereopods 4 and 5 with wide posterior lobes on article 2. Uropod 1 basal peduncle with 17–19 posteriorly inserted spines; distal article with fewer spines. Uropod 2 outer ramus slightly longer than inner, smooth; inner ramus with single long, terminal spine. Telson cleft to one-half or less its length. Mouth parts normally developed for family. Female: Very similar to male but more setose. Maxilliped bearing short setae. Gnathopod 1 with distal and medial setae. Gnathopod 2 with subtriangular coxa; articles 5 and 6 short; palm not clearly oblique. Pereopod 2 coxa with rounded posterior margin.

Type locality: Hourglass Station E, 27°37′N, 84°13′W; 73.2 m; Florida west coast.

Distribution: Central West Florida Shelf; 37–73 m.

Etymology: This species is named in honor of Dr. E. L. Bousfield, National Museum of Natural Sciences of Canada and Royal Ontario Museum, for his many important contributions to our knowledge of amphipod crustacean systematics.

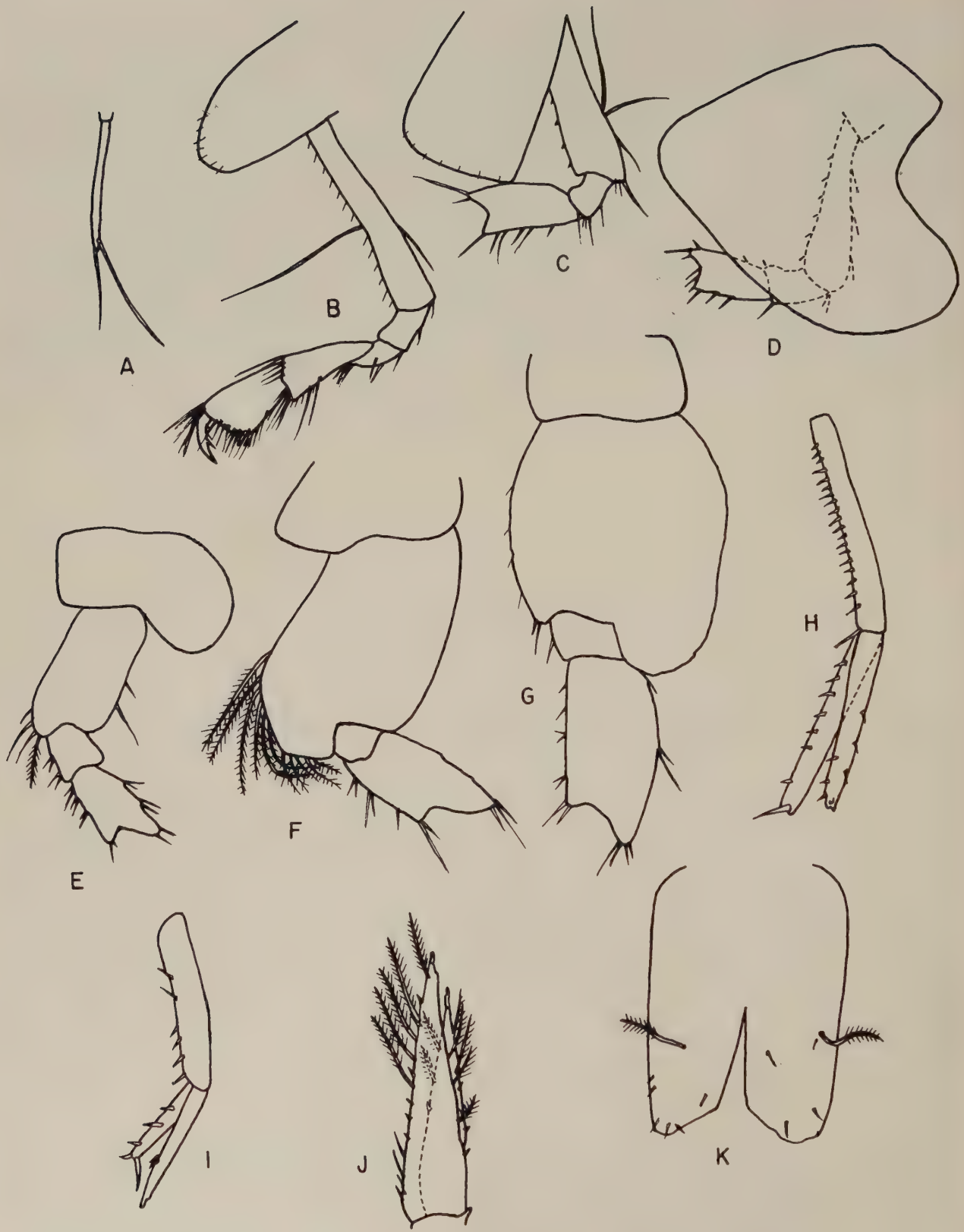

Figure 13. *Carinobatea bousfieldi* n. sp.; ♂; Hourglass Station E; A. gnathopod 1; B. gnathopod 2; C. pereopod 1; D. pereopod 2; E. pereopod 3; F. pereopod 4; G. pereopod 5; H. uropod 1; I. uropod 2; J. uropod 3; K. telson.

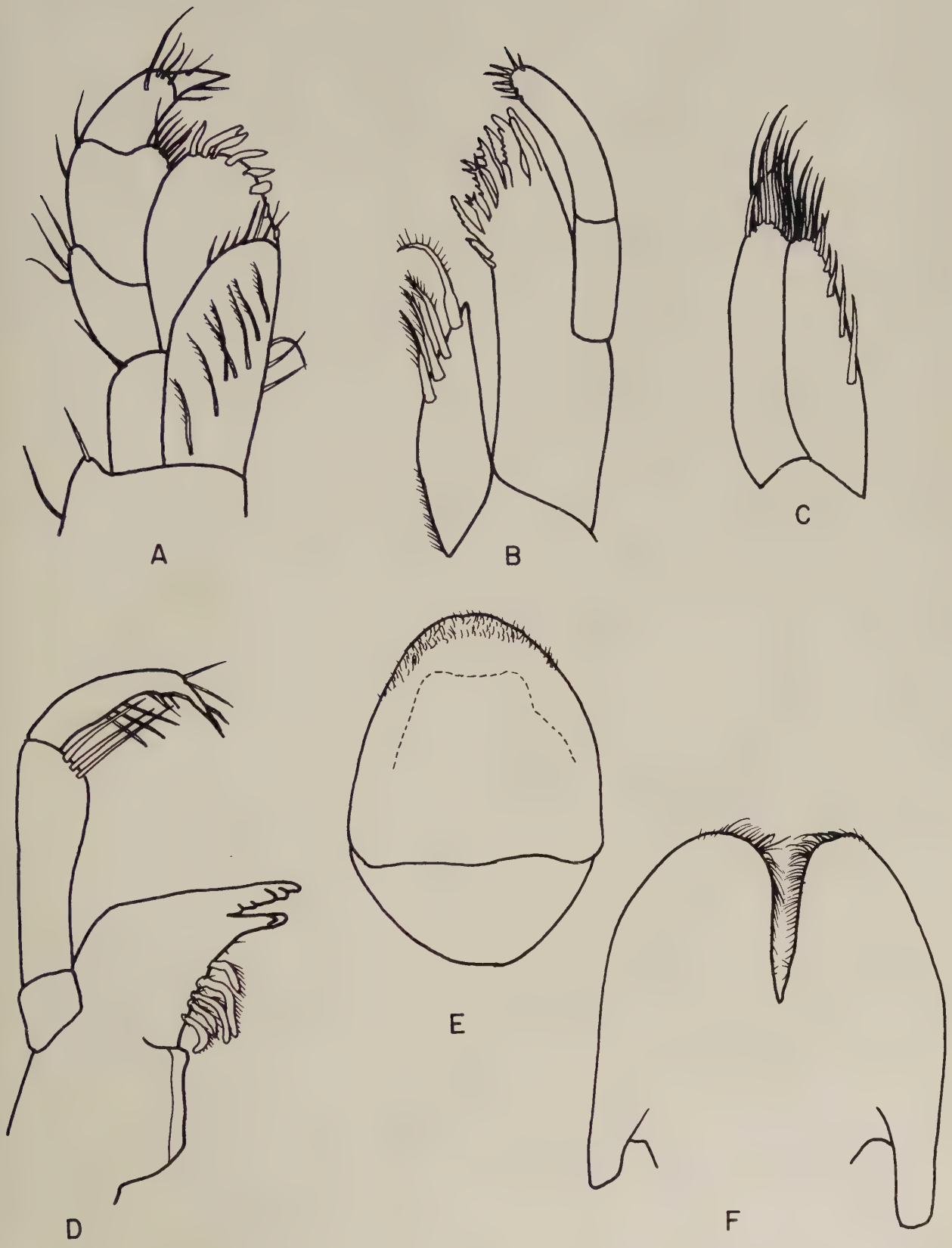

Figure 14. *Carinobatea bousfieldi* n. sp.; ♂; Hourglass Station E; A. maxilliped; B. maxilla 1; C. maxilla 2; D. mandible; E. upper lip; F. lower lip.

Figure 15. *Carinobatea bousfieldi* n. sp.; ♀; Hourglass Station E; A. maxilliped; B. maxilla 1; C. gnathopod 1; D. mandibular palp; E. pereopod 1; F. gnathopod 2; G. pereopod 2; H. pereopod 5.

TABLE 5. NUMBERS OF *CARINOBATEA BOUSFIELDI* COLLECTED DURING PROJECT HOURGLASS, BY STATION AND MONTH.

Carinobatea bousfieldi

STA	1965					1966												1967											TOT
	A	S	O	N	D	J	F	M	A	M	J	J	J sp	A	S	O	N	D	J	J sp	F	M	A	M	J	J	A	S	O	N	
A																															
B_1																															
B_2																															
C_1																															
C_2																														1	1
D_1																															
D_2																															
E																6		3					2				6				17
I																															
J																															
K																															
L																															
M												1			1										1					3
TOT												1			1	6		3					2		1		6		1	21

Subscripts 1, 2, and SP represent regular (night), post (day), and supplementary (45-ft trawl) cruises.

Remarks: The two previously known species, *Carinobatea carinata* and *C. cuspidata*, always have three teeth on the dorsal surface of the body, whereas *C. bousfieldi* has only one tooth on its dorsal surface. Both previously described species are much more common in collections from the Gulf of Mexico and Caribbean Sea than are this species and the species hereafter described.

Carinobatea campi, new species

Figures 16–19

Material examined: HOURGLASS STATION B: 1 ♀ PARATYPE; 2 November 1967; dredge;

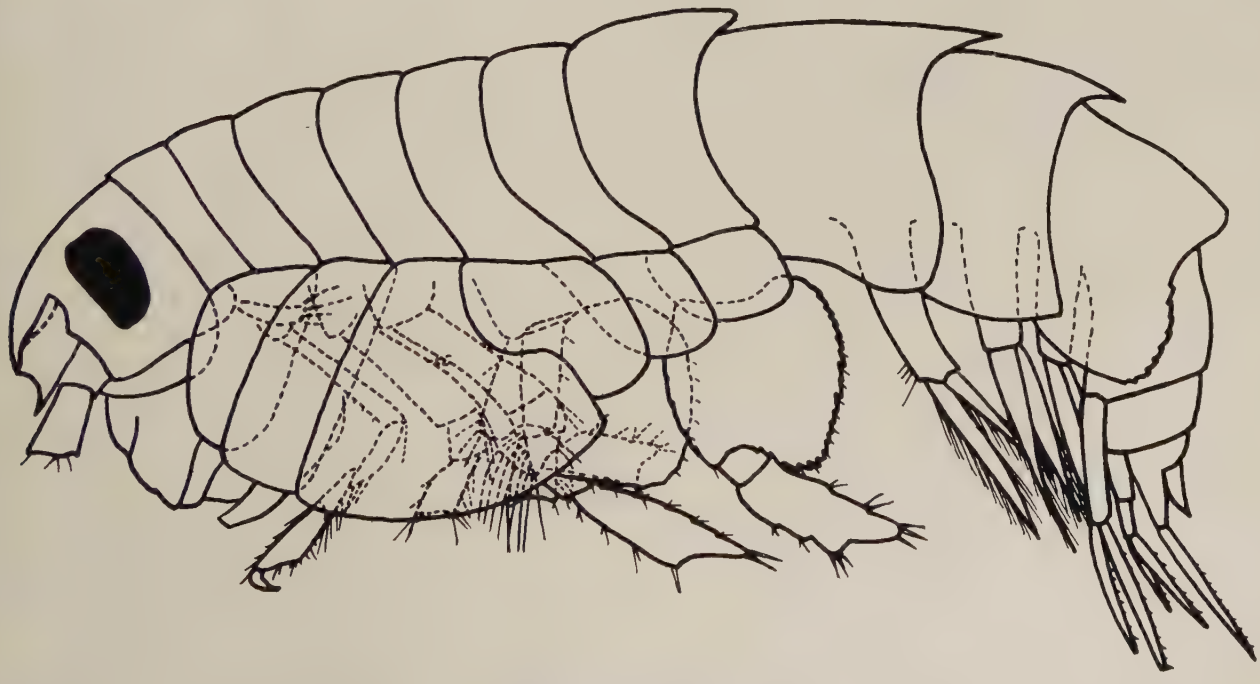

Figure 16. *Carinobatea campi* n. sp.; ♀; Hourglass Station B.

Figure 17. *Carinobatea campi* n. sp.; ♀; Hourglass Station B; A. maxilliped; B. maxilla 1; C. maxilla 2; D. lower lip; E. upper lip; F. mandible.

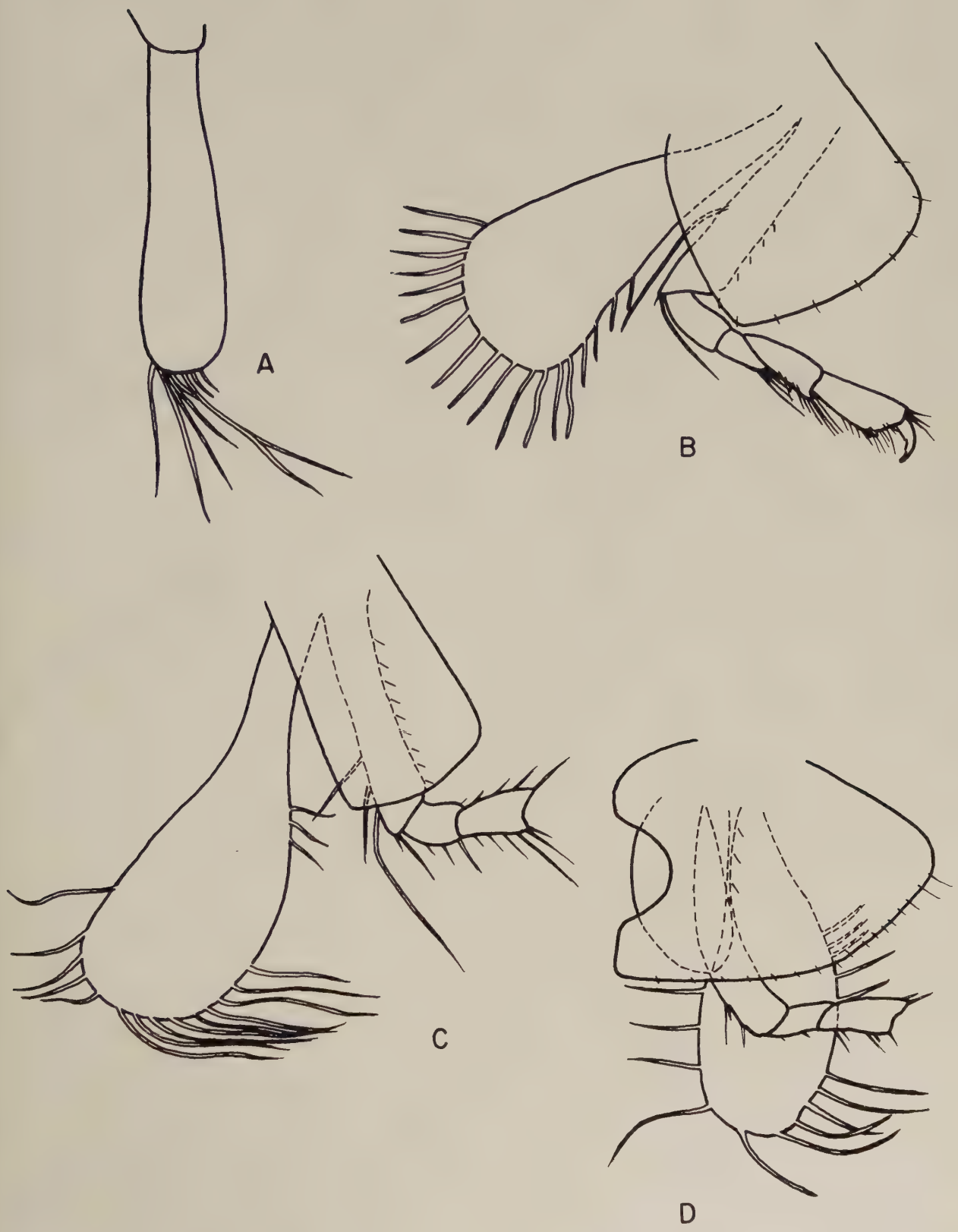

Figure 18. *Carinobatea campi* n. sp.; ♀; Hourglass Station B; A. gnathopod 1; B. gnathopod 2; C. pereopod 1; D. pereopod 2.

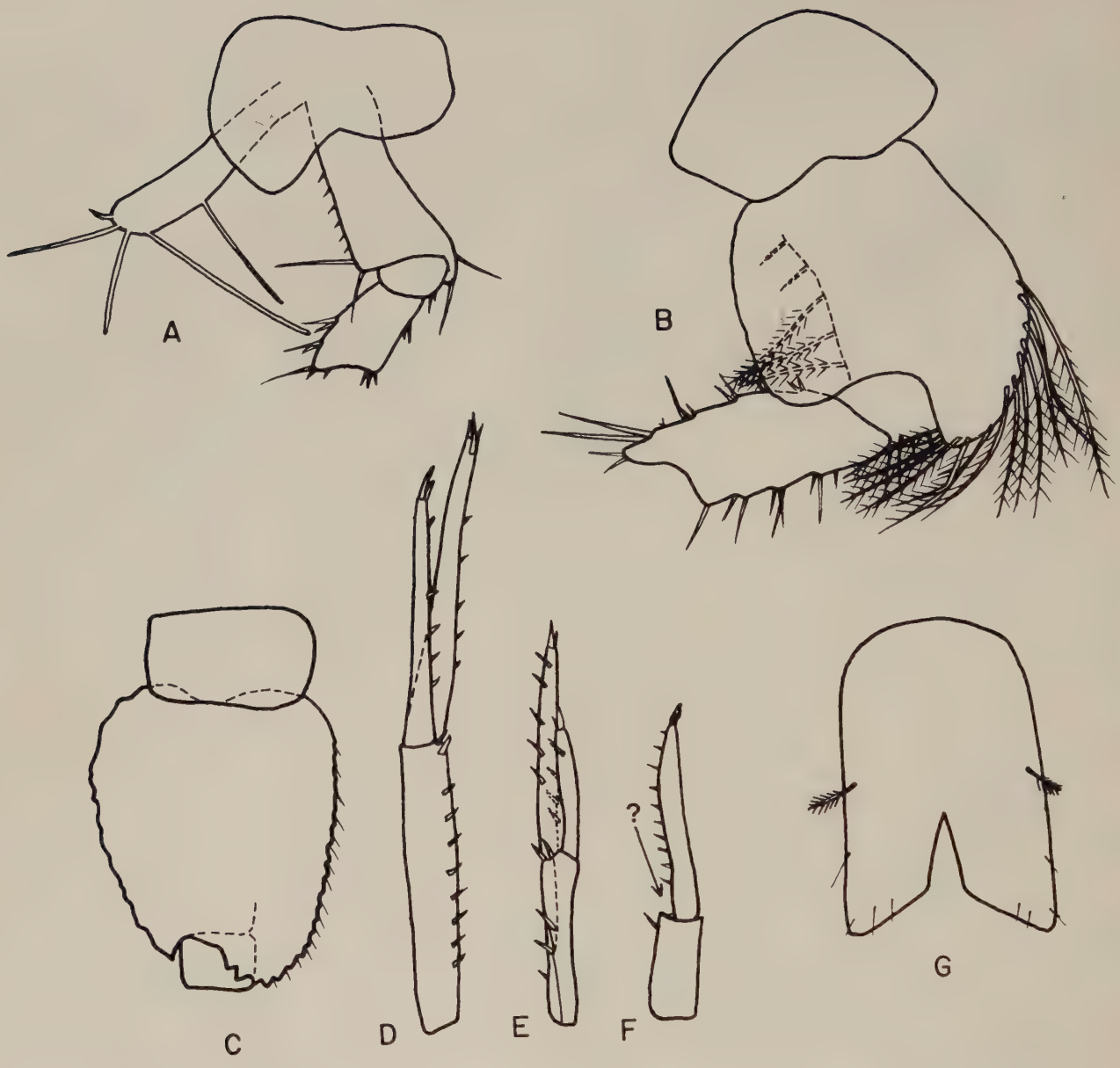

Figure 19. *Carinobatea campi* n. sp.; ♀; Hourglass Station B; A. pereopod 3; B. pereopod 4; C. pereopod 5; D. uropod 1; E. uropod 2; F. uropod 3; G. telson.

FSBC I 33576.—HOURGLASS STATION C: 1 ♀ HOLOTYPE; 11 July 1967; dredge; USNM 253706.—HOURGLASS STATION K: 1 ♂ PARATYPE; 6 December 1966; dredge; USNM 253705.—OTHER MATERIAL: CUBA: 1 ♀; Brisas del Mar Beach, north coast of Habana, Station 20; 4 July 1980; Băcescu corer; CIM.

Description: Male: Single specimen lacking antennae, too small to describe. Female: Head with reniform eyes. Dorsum of body with single prominent tooth on first and second pleonal somite; remainder of body dorsally smooth. Gnathopod 1 with terminal setae only. Gnathopod 2 article 2 long, longer than combined lengths of articles 5 and 6; palm subrectangular, much longer than wide, with oblique margin. Coxa 2 rectangular. Coxa 4 posterior lobe subrectangular, not rounded. Pereopods 2 and 3 article 2 narrow. Pereopods 4 and 5 article 2 with wide, rounded posterior

TABLE 6. NUMBERS OF *CARINOBATEA CAMPI* COLLECTED DURING PROJECT HOURGLASS, BY STATION AND MONTH.

Carinobatea campi

STA	1965					1966													1967										TOT
	A	S	O	N	D	J	F	M	A	M	J	J	J sp	A	S	O	N	D	J	J sp	F	M	A	M	J	J	A	S	O	N	
A																															
B_1																														1	1
B_2																															
C_1																															
C_2																										1					1
D_1																															
D_2																															
E																															
I																															
J																															
K																		1													1
L																															
M																															
TOT																		1								1				1	3

Subscripts 1, 2, and SP represent regular (night), post (day), and supplementary (45-ft trawl) cruises.

lobes. Mouthparts normally developed for family, but maxillipeds bearing long setae. Mandibular palp article 2 widest subdistally.

Type locality: Hourglass Station C, 27°37'N, 83°28'W; 36.6 m; Florida west coast.

Distribution: Central West Florida Shelf to north coast of Cuba; 1.5–36.6 m.

Etymology: This species is named in honor of D. K. Camp, Florida Marine Research Institute, for his assistance and encouragement during the preparation of this report.

Remarks: This is the only species of *Carinobatea* that has two dorsal teeth, one on the last pereonal segment and one on the first pleonal segment.

A protozoan (subclass Peritrichia, order Peritrichida) was fixed to gnathopod 1 (Figure 20) of the specimen from Hourglass Station B. No damage to the gnathopod was detected.

DISCUSSION

DISTRIBUTION

The family Bateidae is known only from the New World and contains ten species (Table 7): five in the western Atlantic, four in the eastern Pacific, and one, *Batea transversa*, evidently in both oceans. A subspecies, *B. transversa coyoa* Barnard, 1969, is also known in the eastern Pacific. Barnard (1969a) defined all species of Bateidae as warm-temperate or tropical, despite records to the contrary. *Batea catharinensis* has been reported several times from Virginia to Massachusetts, and *B. transversa* was described from Pt. Loma and Santa Catalina Island, California. Thus, it seems that some species of *Batea* exist also in cold-temperate environments. The remaining species of *Batea* are known only from warm-temperate or tropical regions. The fauna of offshore stations within the Hourglass study area contains a strong tropical component

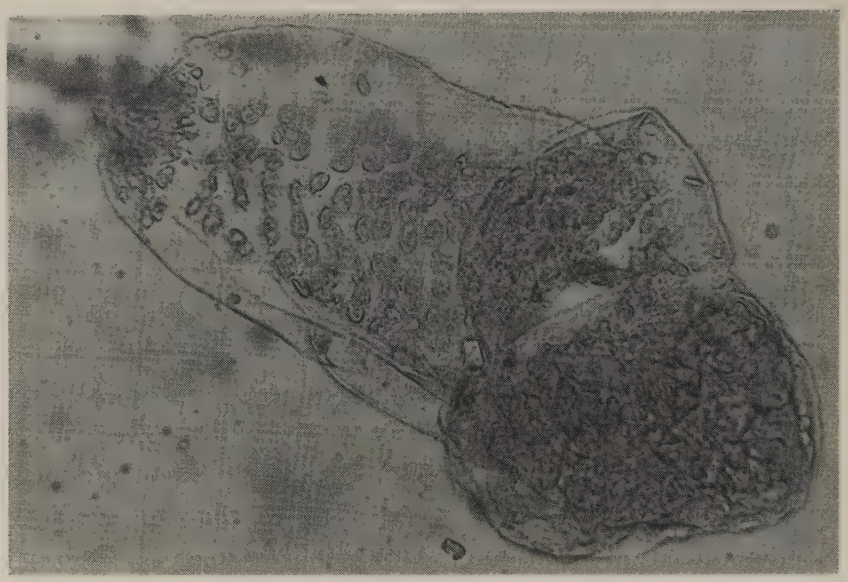

Figure 20. Protozoan (order Peritrichida) affixed to gnathopod 1 of *Carinobatea campi* n. sp., Hourglass Station B.

TABLE 7. LIST OF ALL KNOWN BATEID SPECIES AND SUBSPECIES AND THEIR TYPE LOCALITIES.

Batea catharinensis Müller, 1865	Desterro, Brazil.
Batea lobata Shoemaker, 1926	La Jolla, California.
Batea rectangulata Shoemaker, 1925	San Francisquito Bay, Gulf of California.
Batea susurrator Barnard, 1969	Bahía de los Angeles, Gulf of California.
Batea transversa Shoemaker, 1926	Off Point Loma, California.
Batea transversa coyoa Barnard, 1969	Bahía de los Angeles, Gulf of California.
Carinobatea carinata Shoemaker, 1926	Off west coast of Florida, 28°45′N, 85°02′W.
Carinobatea conductor Barnard, 1969	Reef between Isla Ventana and Isla Cabeza de Caballo, Gulf of California.
Carinobatea cuspidata Shoemaker, 1926	Between Water Island and St. Thomas, Virgin Islands.
Carinobatea bousfieldi new species	Hourglass Station E, 27°37′N, 84°13′W; 73 m; about 78 nmi off Egmont Key, Florida west coast.
Carinobatea campi new species	Hourglass Station C, 27°37′N, 83°28′W; 37 m; about 38 nmi off Egmont Key, Florida west coast.

(Dardeau, 1984), supporting the hypothesis that all species of *Carinobatea* have tropical affinities.

No species of *Batea* occurred in Hourglass collections, but all four western Atlantic species of *Carinobatea* were represented (Table 8). *Carinobatea cuspidata* was collected only in 18-m

TABLE 8. DEPTHS AND STATIONS OF OCCURRENCE OF BATEID AMPHIPODS IN THE HOURGLASS STUDY AREA.

Depth (m)	6		18		37		55		73	
Station	A	I	B	J	C	K	D	L	E	M
Carinobatea carinata	X		X	X	X	X	X	X	X	X
Carinobatea cuspidata			X							
Carinobatea campi			X		X	X				
Carinobatea bousfieldi					X				X	X

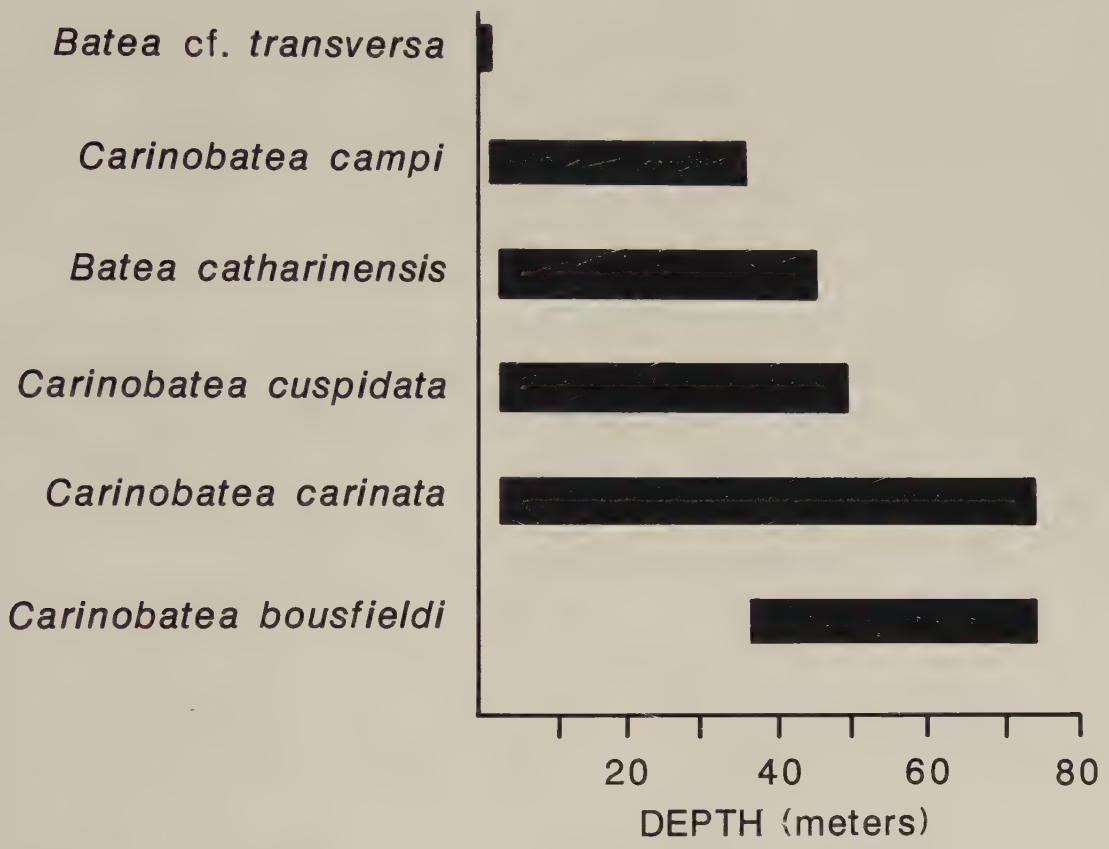

Figure 21. Vertical distribution of bateid amphipods in the Gulf of Mexico and Caribbean Sea.

depths (four samples, Station B), and *C. campi* was collected one time each at Stations B (18 m), C, and K (both 37 m). *Carinobatea carinata* occurred at each of the five depths sampled but was most abundant (70.9%) at 55-m Stations D and L. *Carinobatea bousfieldi* occurred in one sample at Station C (37 m) and in six samples at Stations E and M (73 m), suggesting affinity for the latter depth.

The Cuban specimens and other published records indicate that species of *Batea* are restricted to depths less than 25 m in the Gulf of Mexico and Caribbean Sea (Figure 21). Although not collected in the Hourglass study, *Batea catharinensis* has been reported in more temperate estuarine and nearshore environments in the northern and eastern Gulf of Mexico (Shoemaker,

1926; Farrell, 1970, 1979; Christmas and Langley, 1973). Three species of *Carinobatea* (*C. cuspidata*, *C. carinata*, *C. campi*) reported here from collections in the shallow (3–7 m), tropical Cuban environment also occurred at greater depths off western Florida, in what was probably an expression of northern submergence of typically shallow-water tropical fauna. The fourth species, *C. bousfieldi*, was most common at 73-m depths off western Florida; that species might be expected to occur in Cuba in depths greater than 3–7 m.

SYMBIOSIS

Considerable information about symbiosis in crustaceans has been published, but very little of that information concerns amphipods. Since Luther (1904) described the larval stage of *Echinorhynchus polymorphus* in *Gammarus locusta* (Linnaeus, 1758), several other papers describing similar relationships have been published (Dumbar, 1946; Băcescu and Mayer, 1960; Barnard, 1961; Ginsburger-Vogel and Desportes, 1979a, b). Van Maren (1978) recently compiled the available literature regarding amphipod-acanthocephalan relationships; but according to the literature consulted, there is no information specifically dealing with the American Mediterranean species. I have found several symbiotic relationships between Cuban amphipods and other groups (symbiotic relationships with protozoans [Gregarinia] and with the copepod genus *Sphaeronelopsis* being most important), but I have not seen such relationships with bateid amphipods.

Two cases of symbiosis were found among the Hourglass material of the family Bateidae. In the first, a protozoan belonging to the order Peritrichida was fixed on the first gnathopod of *Carinobatea campi*. The second case involved two cysts, probably of Trematoda, on the muscular insertion of a pereopod and on the second maxilla of a specimen of *C. carinata* (see remarks for those species). The frequency of infestation in American Mediterranean bateid amphipods seems to be very low, at least to the extent that such parasitic infestations can be detected in preserved specimens.

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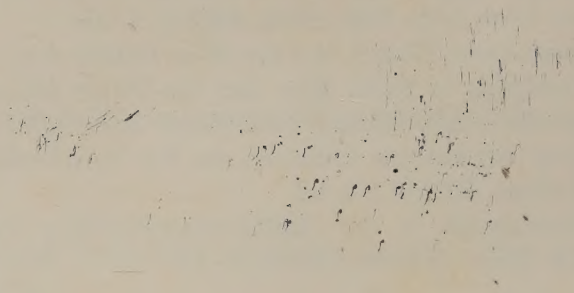

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